What is claimed is:

1. A microfluidic device manufactured by binding a sensing substrate including a sensing electrode, an electrode interconnect, and a electrode pad, with a channel substrate including at least two fluid inlet ports, a chamber, and a channel,

wherein a first fluid injected via one of the fluid inlet ports flows by natural capillary force, and a second fluid injected via another fluid inlet port is forced to flow by an external pump.

2. The microfluidic device of claim 1, wherein the first fluid flows along a predetermined channel up to a site of designation by capillary force, and the second fluid is forced to push out the first fluid that stays at the site of designation for fluid exchange.

3. The microfluidic device of claim 1, wherein the first fluid is injected as a sample after the immobilization of biological/chemical substances on the sensing electrode, and the reaction product between the first fluid and the biological/chemical substance is electrochemically detected.

4. The microfluidic device of claim 1, wherein the sensing substrate further comprises recesses to correspond to the multiple fluid inlet ports, the chamber, and/or the channel.

5. The microfluidic device of claim 1, wherein one of the sensing substrate and the channel substrate is formed of a hydrophobic material and the other is formed of a hydrophilic material.

6. The microfluidic device of claim 1, wherein both of the sensing substrate and the channel substrate are formed of a hydrophobic or hydrophilic material with different degrees of hydrophobicity or hydrophilicity.

7. The microfluidic device of claim 5, wherein a hydrophobic or hydrophilic material is applied to a local region on the inner surface of the sensing substrate or the channel substrate, with a different degree of hydrophobicity or hydrophilicity with respect to the material composing the corresponding substrate.

8. The microfluidic device of claim 6, wherein a hydrophobic or hydrophilic material is applied to a local region on the inner surface of the sensing substrate or the channel substrate, with a different degree of hydrophobicity or hydrophilicity with respect to the material composing the corresponding substrate.

9. The microfluidic device of claim 1, wherein the channel comprises a main channel and a sub-channel branching off from the main channel, and a micro heater is additionally installed in the sub-channel.

10. The microfluidic device of claim 1, wherein the channel substrate and the sensing substrate are bound together using an adhesive material, are bound using an additional clip-type structure, or are bound by fitting projections formed on one of the channel substrate and the sensing substrate into grooves formed on the other.

11. A microfluidic device manufactured by binding a sensing substrate including a sensing electrode, an electrode interconnect, and an electrode pad, with a channel substrate including a first fluid inlet port at a side of the channel substrate, a first fluid addition chamber around the first fluid inlet port, a sample reaction barrier, a sensing chamber, a second fluid inlet port at the other side of the channel substrate, a second fluid addition chamber around the second fluid inlet port, a channel connecting the second fluid addition chamber and the sensing chamber, and a used reagent reservoir connected to the sensing chamber,

wherein a sample injected via the first fluid inlet port flows into the sensing chamber through the first fluid addition chamber by capillary force and stops flowing at the sensing chamber having appreciably large outlets, and a buffer solution loaded via the second fluid inlet port is forced to flow by the action of an external pump, through the channel and the sensing chamber, and is reserved in the used reagent chamber.

12. The microfluidic device of claim 11, further comprising a reaction chamber and a time delay between the reaction barrier and the sensing chamber.

13. The microfluidic device of claim 11, wherein the sensing substrate further comprises recesses to correspond to the multiple fluid inlet ports, the chamber, and/or the channel.

14. The microfluidic device of claim 12, wherein the sensing substrate further comprises recesses to correspond to the multiple fluid inlet ports, the chamber, and/or the channel.

15. The microfluidic device of claim 11, wherein one of the sensing substrate and the channel substrate is formed of a hydrophobic material and the other is formed of a hydrophilic material.

16. The microfluidic device of claim 15, wherein a hydrophobic or hydrophilic material is applied to a local region on the inner surface of the sensing substrate or the channel substrate, with a different degree of hydrophobicity or hydrophilicity with respect to the material composing the corresponding substrate.

17. The microfluidic device of claim 11, wherein both of the sensing substrate and the channel substrate are formed of a hydrophobic or hydrophilic material with different degrees of hydrophobicity or hydrophilicity.

18. The microfluidic device of claim 7, wherein a hydrophobic or hydrophilic material is applied to a local region on the inner surface of the sensing substrate or the channel substrate, with a different degree of hydrophobicity or hydrophilicity with respect to the material composing the corresponding substrate.

19. The microfluidic device of claim 11, wherein the channel comprises a main channel and a sub-channel branching off from the main channel, and a micro heater is additionally installed in the sub-channel.

20. The microfluidic device of claim 11, wherein the channel substrate and the sensing substrate are bound together using an adhesive material, are bound using an additional clip-type structure, or are bound by fitting projections formed on one of the channel substrate and the sensing substrate into grooves formed on the

other.